

INFO(bio)CHAR-INFORMAZIONI PER UN PERCORSO  
SOSTENIBILITÀ

Giovedì 31 ottobre 2019, Vertemate con Minoprio (CO)

**GAS SERRA E  
AGRICOLTURA:  
INQUADRAMENTO DEL  
TEMA E RISULTATI**

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PROGETTO**

**Simone Pelicciotti**

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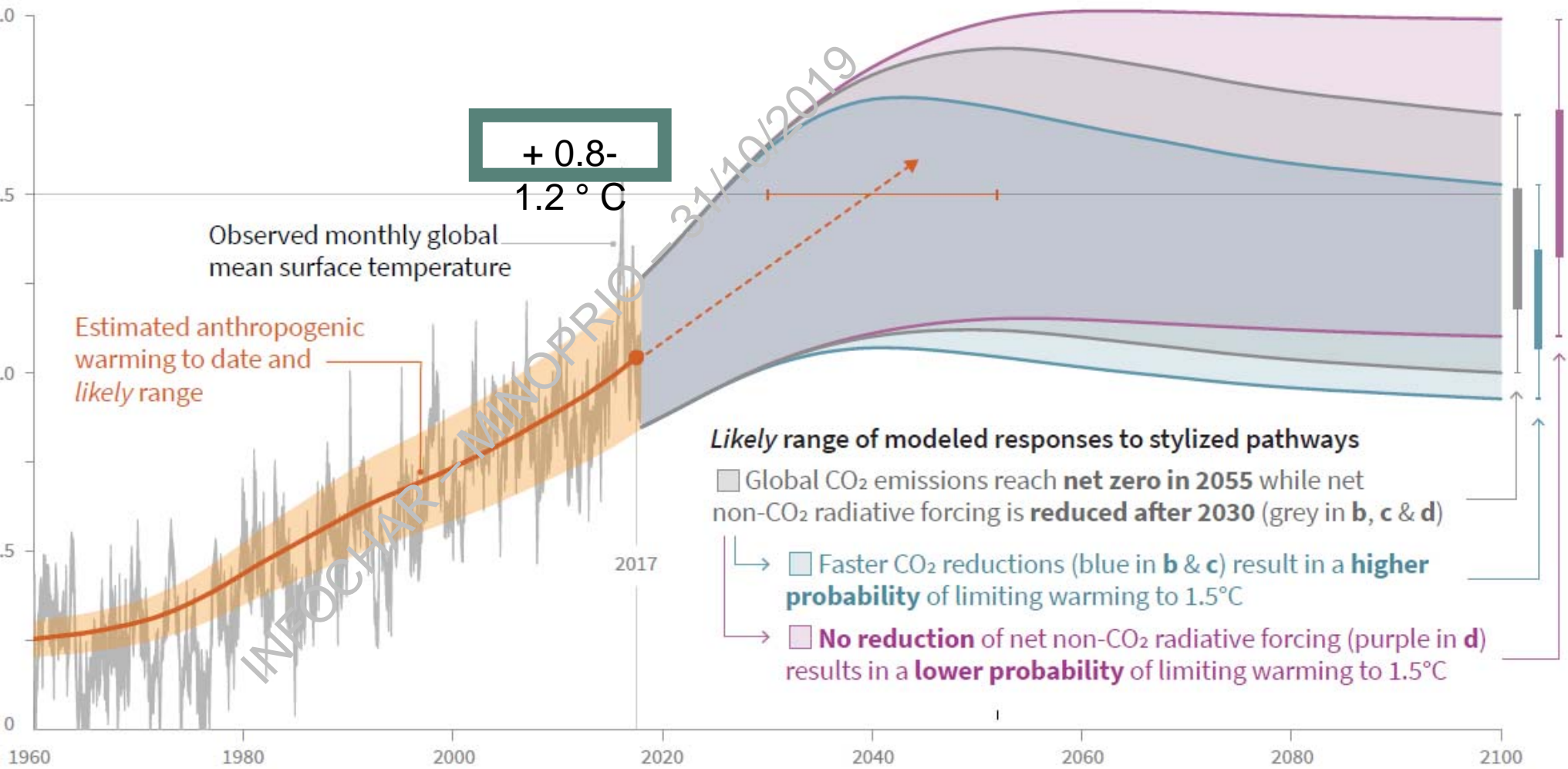
**to globale:**

**I NUMERI  
DEL  
CAMBIAMEN  
TO**

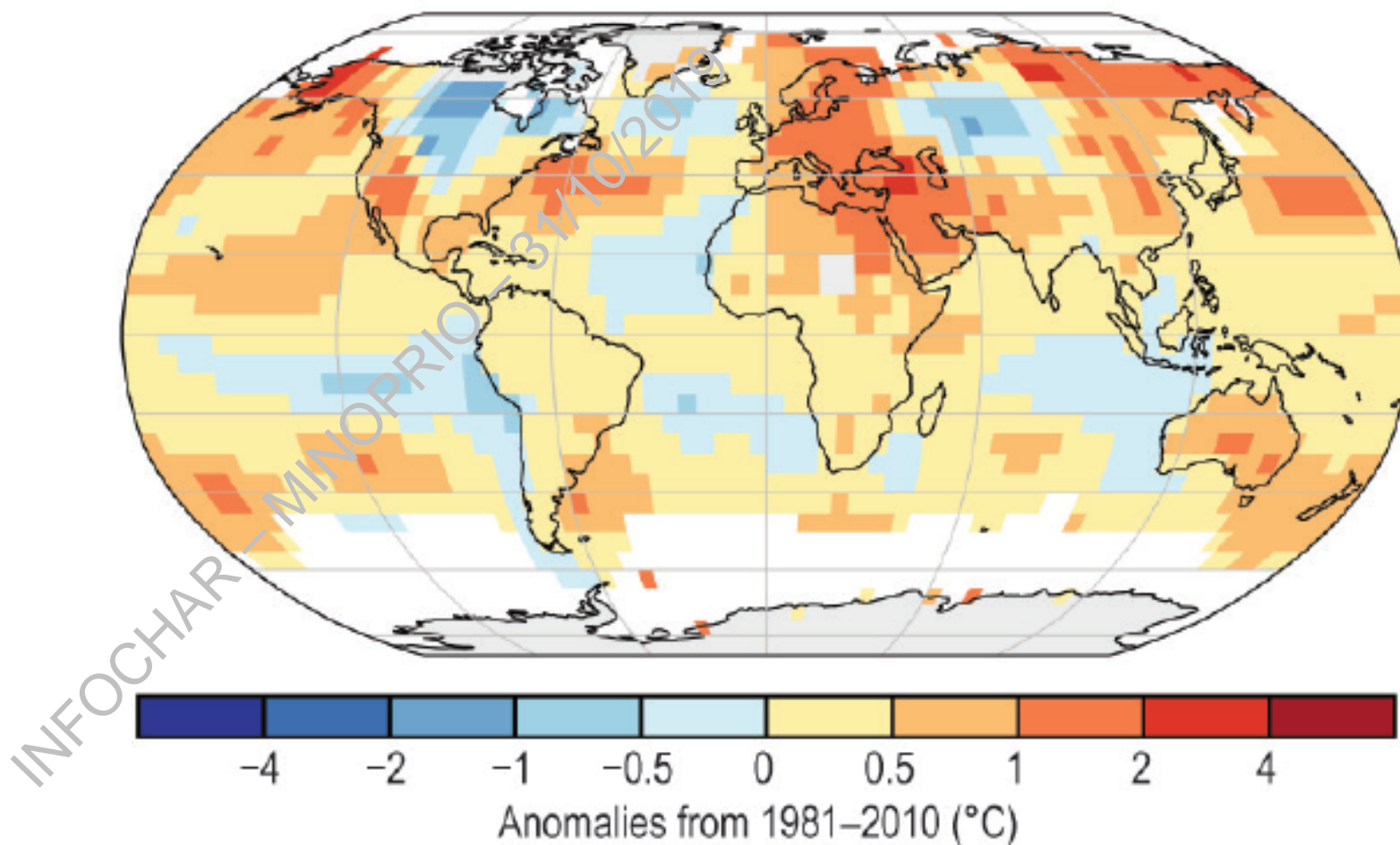
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# Observed global temperature change and modeled responses to stylized anthropogenic emission and forcing pathways

Global warming relative to 1850-1900 (°C)

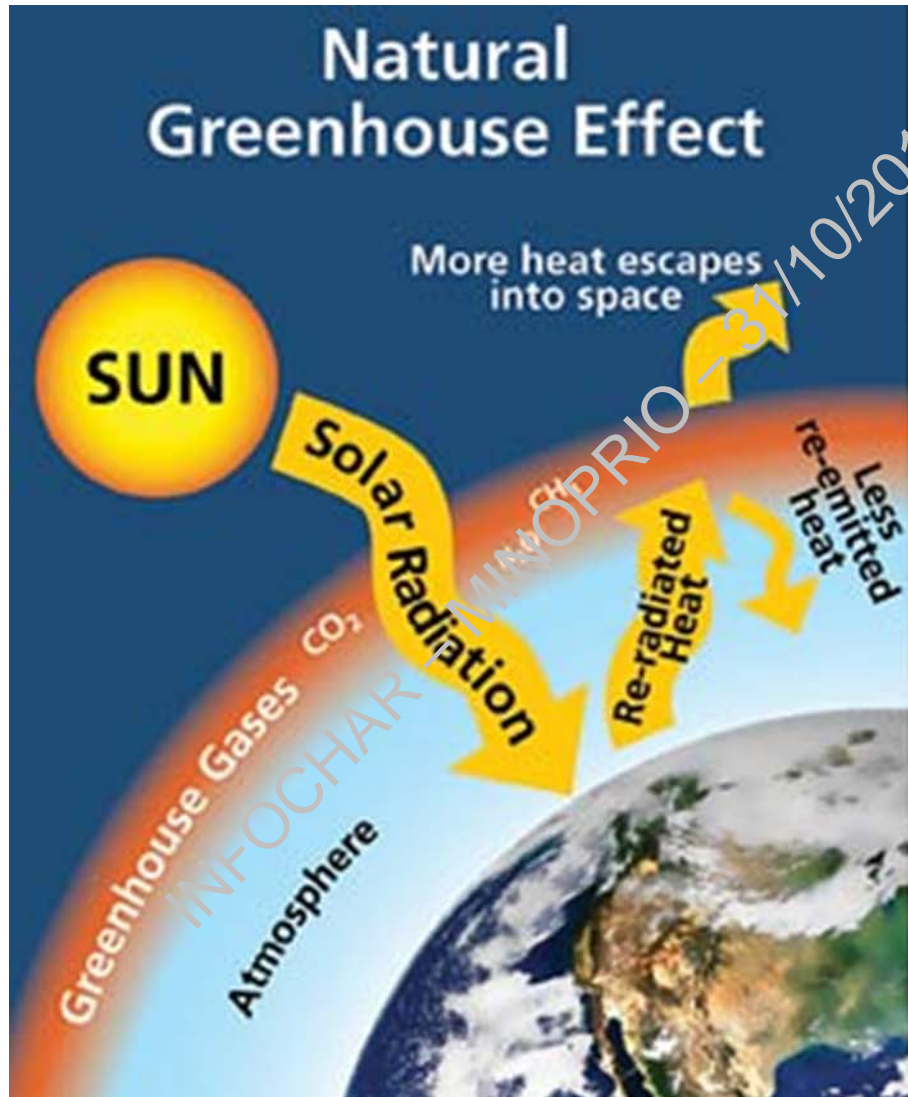


partire dal 1901, la superficie del pianeta si è riscaldata in media di 0.7–0.9° Celsius per secolo, ma il tasso di riscaldamento è quasi raddoppiato dal 1975 a raggiungere 1.8° Celsius (2.7–3.2° Fahrenheit) per secolo (State of the Climate in 2019 report).



Blunden, J. and D. S. Arndt, Eds., 2019: State of the Climate in 2019.  
Bull. Amer. Meteor. Soc.. 100

# COSA CI TIENE CALDO?



Gas	Contribution to the greenhouse effect (%) <sup>a</sup>
CO <sub>2</sub>	26
CH <sub>4</sub>	3
Atmospheric O <sub>3</sub>	8
N <sub>2</sub> O	<1
Water vapour	60
HFCs+PFCs+SF <sub>6</sub>	<1
Atmospheric O <sub>3</sub>	<1
Aerosols	<1

Source: Kiehl and Trenberth, 1997.

Source: IPCC, 2007. For water vapour only: H<sub>2</sub>O

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# LL RESPONSABI LITÀ DELL'AGRIC OLTURA

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transportation

**Carbon dioxide**



fossil fuel combustion

coal and crude oil

agriculture

**Methane**

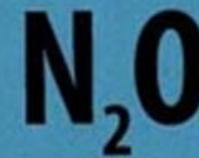


natural gas systems

landfills

cars

**Nitrous oxide**



manufacturing

agricultural soil management

**hydrofluorocarbons**

substitute of ODS

**HFCs**

semiconductor manufacturing

**perfluorocarbons**

aluminium production

**PFCs**

electrical transmission

**SF<sub>6</sub>**

**sulfur hexafluoride**

magnesium prod

## Greenhouse gases (GHG) and their sources



The global warming potential (GWP) of each GHG is measured using the equation 'Tg CO<sub>2</sub>Eq'. Each gas's GWP is measured against the reference gas, CO<sub>2</sub>. CO<sub>2</sub> is measured in 1 million metric tons. 1 metric ton is 1000 kilograms = average weight of a female giraffe.



# Agriculture, Forestry and Other Land Use (AFOLU)



24%

## DISTRIBUTION OF GLOBAL GREENHOUSE GAS (GHG) EMISSIONS BY SECTOR

Energy



35%

Industry



21%

Transport



14%

Buildings



6%

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# The largest emitters in agriculture

## GLOBAL

40%



Enteric  
fermentation

16%



Manure left  
on pasture

12%



Synthetic  
fertilizers

10%



Paddy  
rice

7%



Manure  
management

5%



Burning of  
savannahs

Livestock-related emissions from enteric fermentation and manure contributed to nearly two-thirds of the total.

Figures are averages for the period 2005-2014

GRICOLA

IL

PRINCIPAL

RESPONSA

ILE

DELL'EMIS

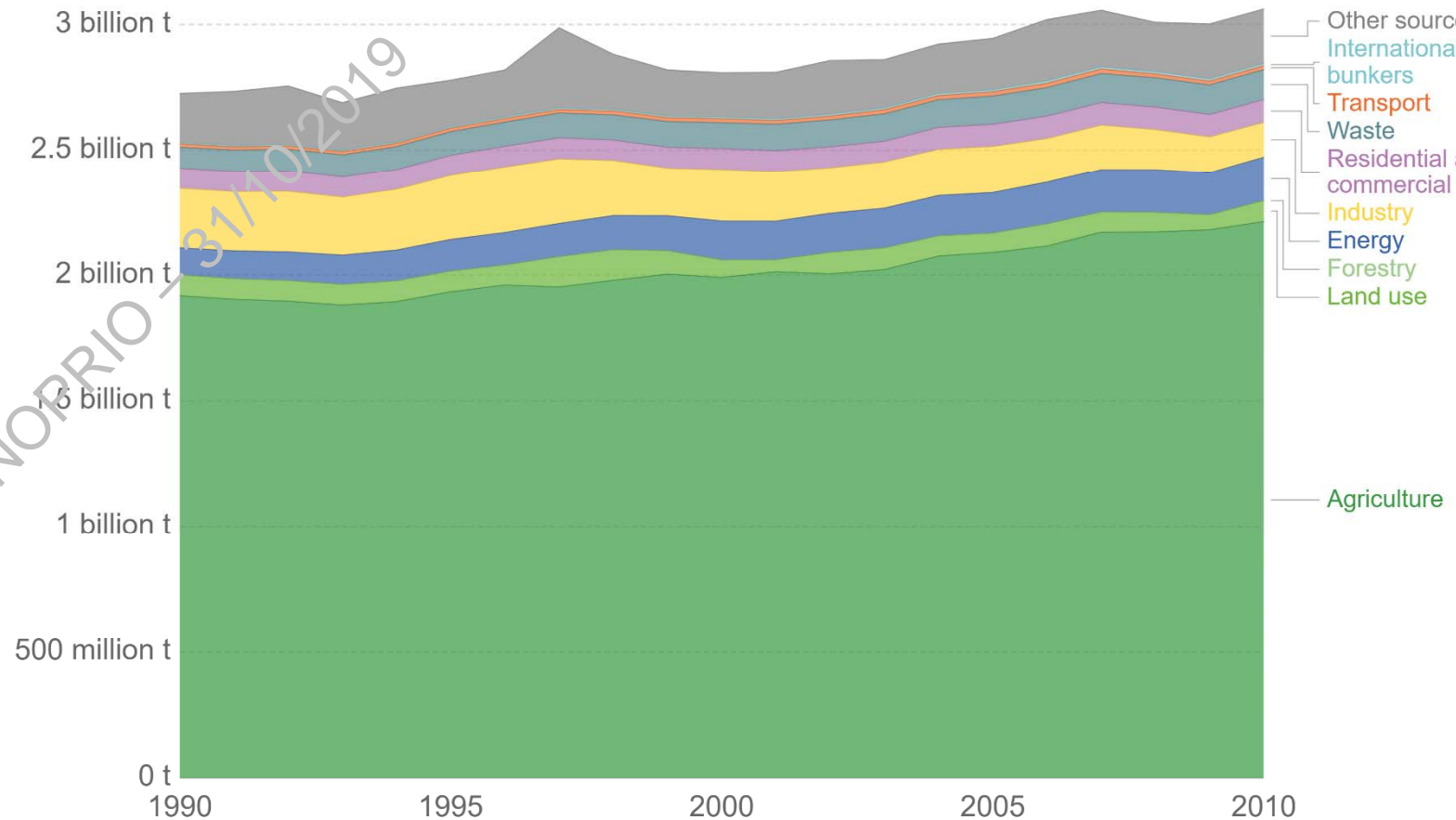
SIONE DI

CO<sub>2</sub> IN

TEMPO

## Nitrous oxide emissions by sector, World

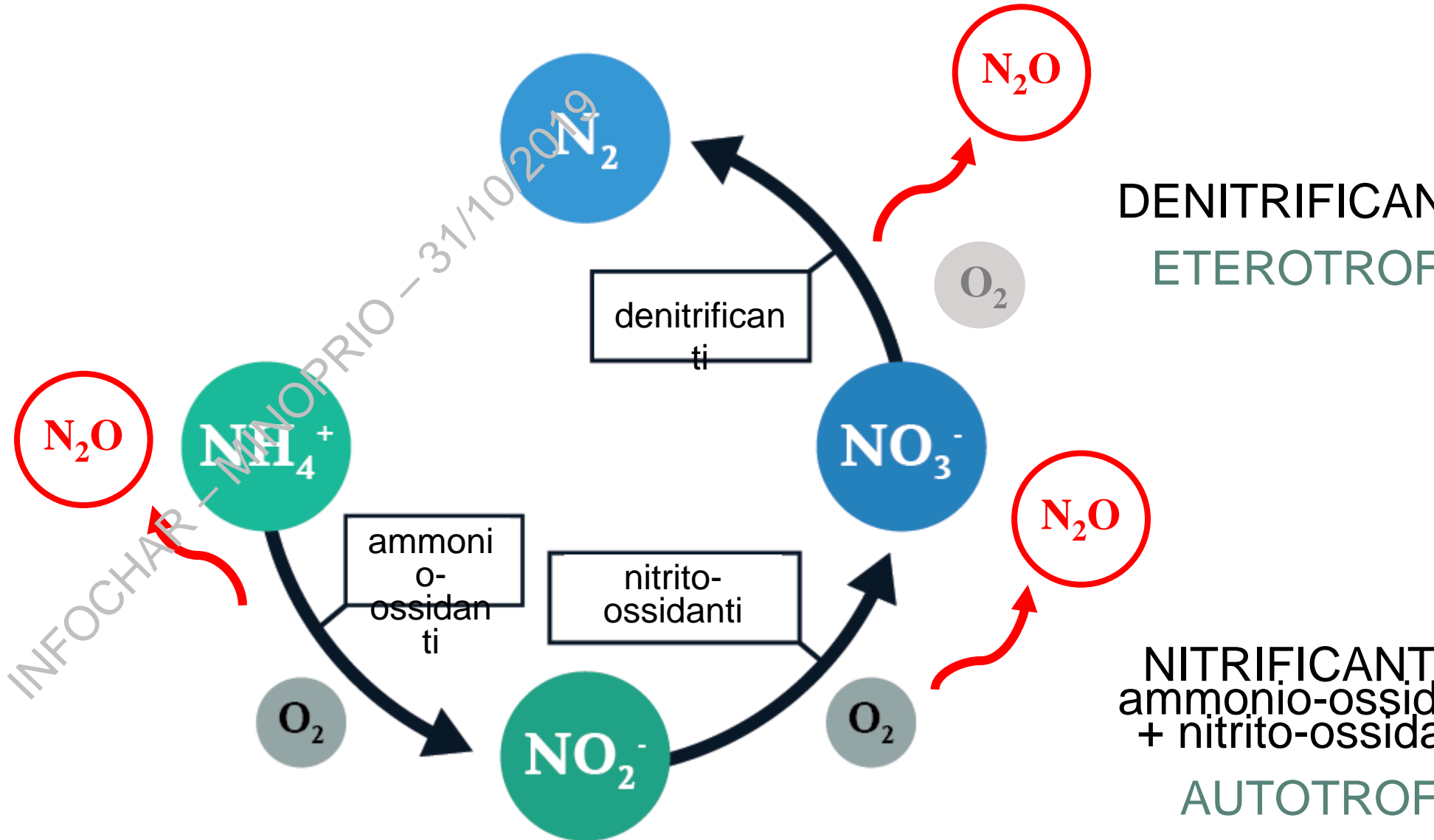
Breakdown of total global nitrous oxide (N<sub>2</sub>O) emissions by sector, measured in tonnes of carbon dioxide equivalents (CO<sub>2</sub>e). Carbon dioxide equivalents measures the total greenhouse gas potential of the full combination of gases, weighted by their relative warming impacts.



Source: UN Food and Agricultural Organization (FAO)

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC

# NEI SUOLI AGRARI?



# L'AZIONE DEL BIOCHAR per contrastare i cambiamenti climatici

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- ❖ **sequestro del carbonio nei suoli**
- ❖ **mitigazione dell'emissione di N<sub>2</sub>O**

**- 54% Cayuela et al. 2014 (3**

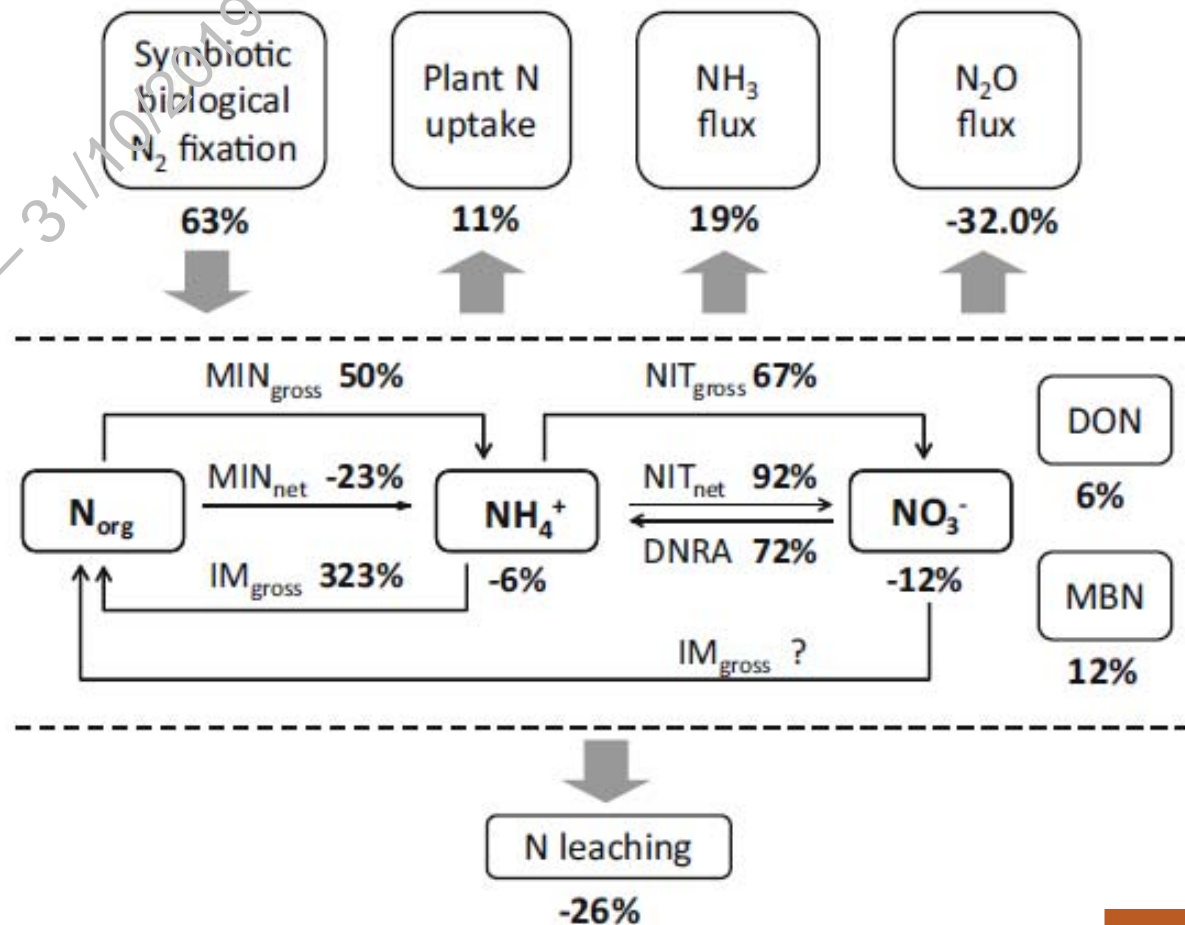
**- 32% Liu et al. 2018 (20**

**- 38% Borchard et al. 2019 (8**

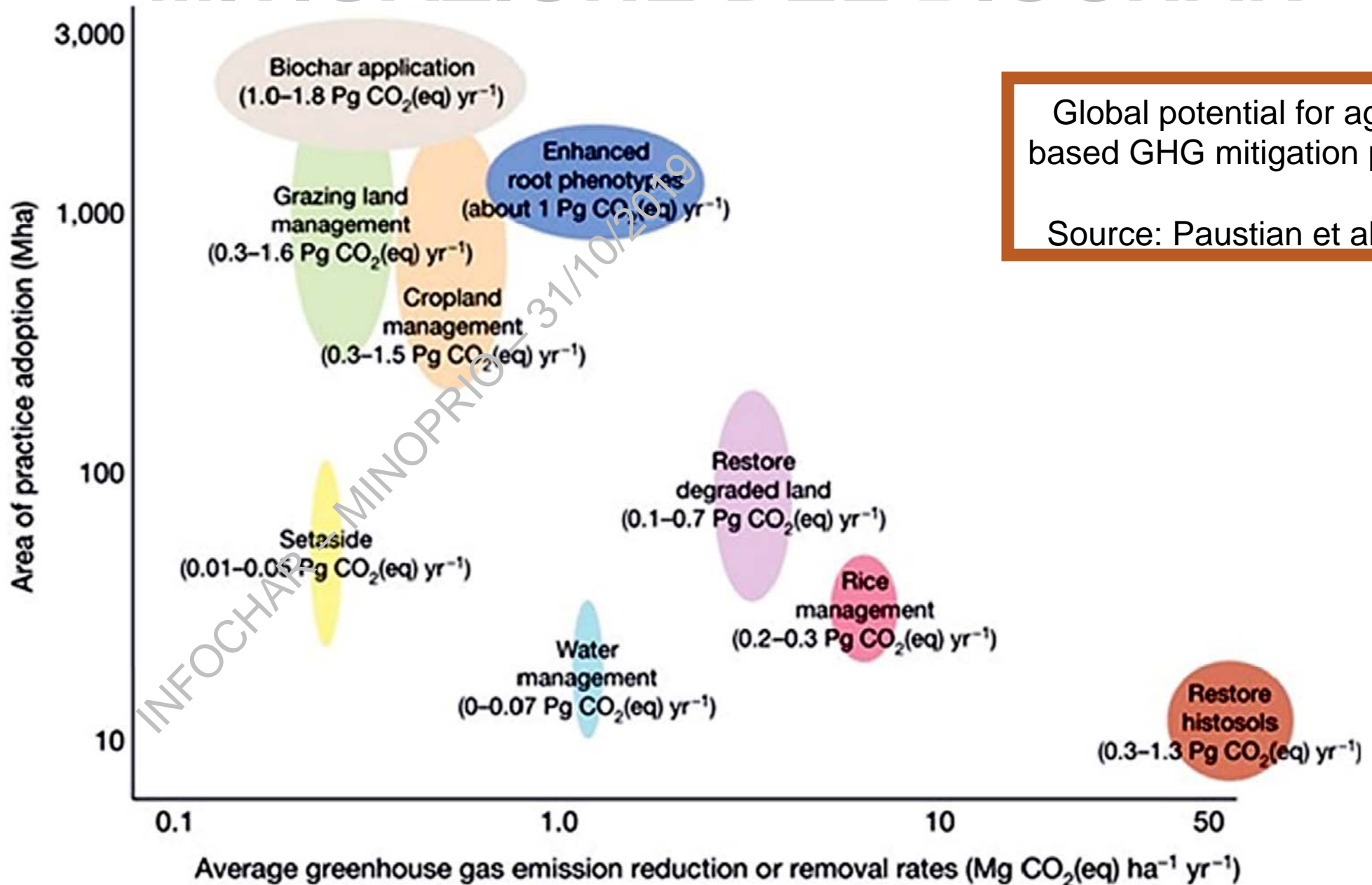
**stuc**

# LE INTERAZIONI DEL BIOCHAR CON IL CICLO DELL'AZOTO

Fig. 7 Summary of the average effects of biochar on soil N cycle. Data represents the percentage change of corresponding items induced by biochar amendment.  $MIN_{gross}$ , soil gross mineralization;  $MIN_{net}$ , soil net mineralization;  $IM_{gross}$ , soil gross immobilization of  $NH_4^+$ -N to organic N;  $NIT_{gross}$ , soil gross nitrification;  $NIT_{net}$ , soil net nitrification; DNRA, soil dissimilatory nitrate reduction to ammonium



# MITIGAZIONE DEL BIOCHAR







# **Le emissioni di GHG misurate nel progetto INFOCHAR**

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# I trattamenti monitorati



Tecnica delle camere chiuse  
Prelievo 3 campioni a  
intervalli regolari  
Analisi GC

❖ 201  
8

❖ 201  
9

11 trattamenti,  
2 biochar x 1 dose  
punti di misu

7 trattamenti, 17 pu  
di misu

3 testimoni senza biochar  
(concimazione minerale, refl  
zootecnico, digestato)

2 biochar x 3 tipi di  
concimazione x 1 dose

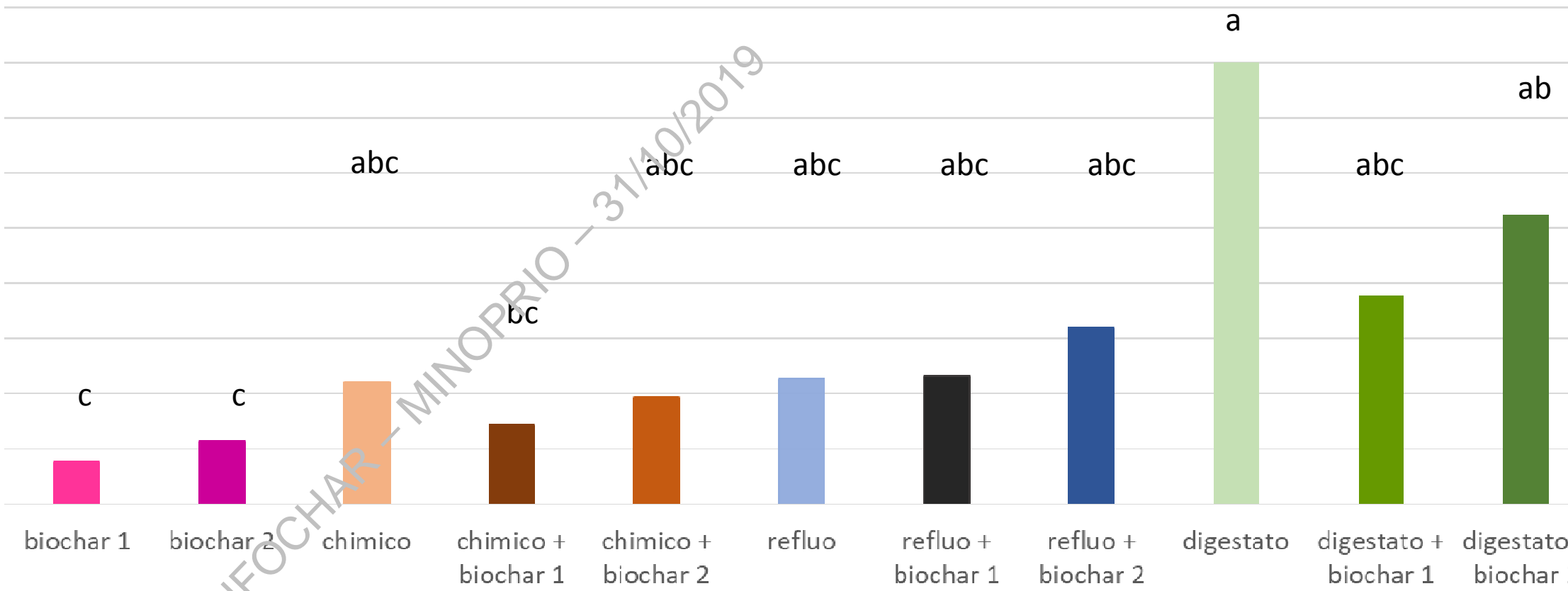
2 biochar x 1 dose

3 testimoni senza biochar  
(concimazione minerale,  
refluo zootecnico, digestato)

1 biochar x 3 tipi di  
concimazione x 1 dose



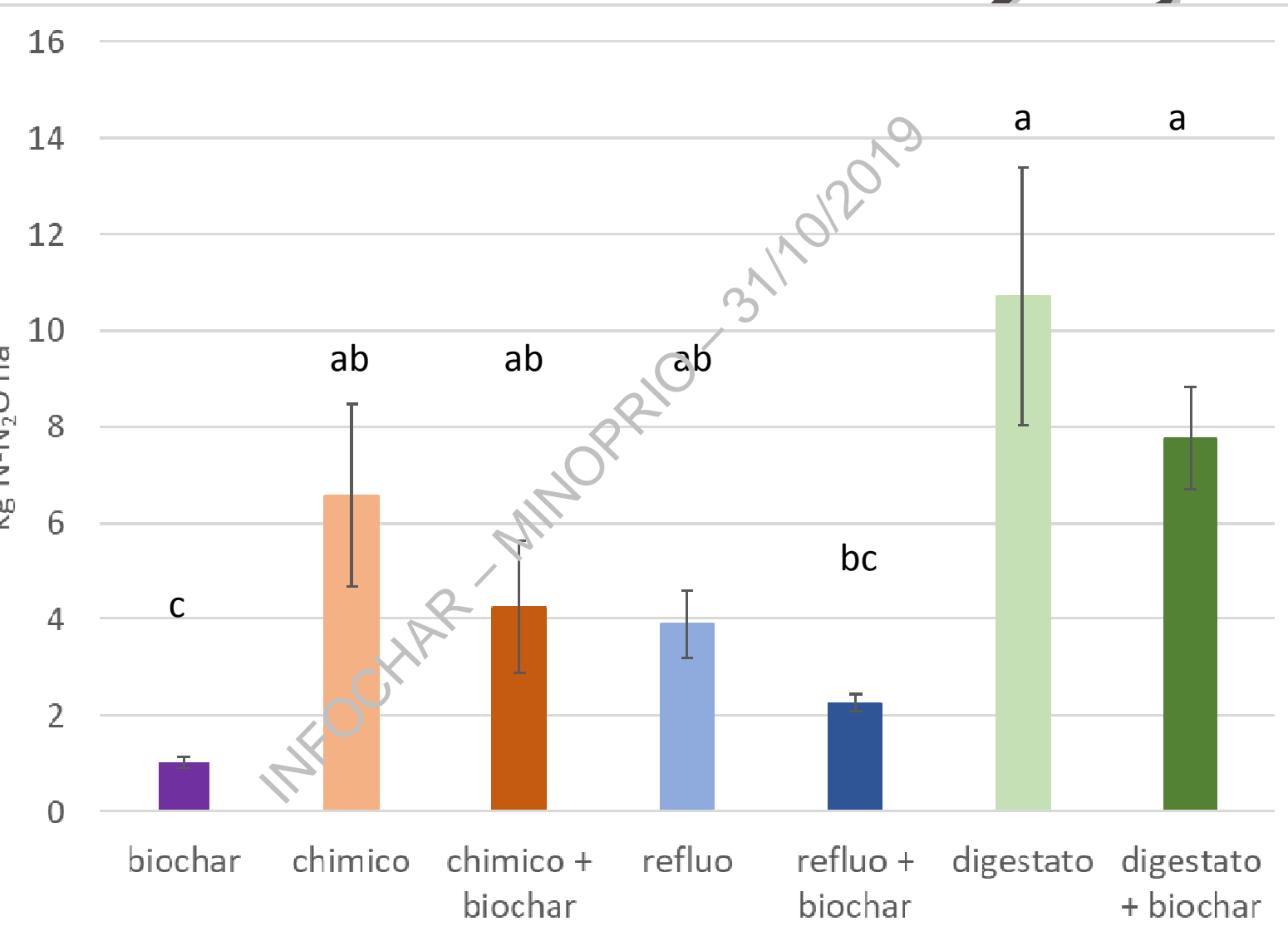
# N<sub>2</sub>O, 2018



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# N<sub>2</sub>O, 2019



	EF(%N <sub>2</sub> O)
	<b>2018</b>
chimico	13
chimico+biochar	11
refluo	13
refluo+biochar	19
digestato	4.7
digestato+biochar	4.2

**DIGESTATO: 18% N org/N totale**

**C/N**

**REFLUO: 71% N org/N totale**

**C/N**

ALTA VARIABILITÀ  
SPAZIALE

ELEVATA  
VARIABILITÀ  
INTERANNUALE

L'EFFETTO SI PROTRAE  
ANCHE NEL SECONDO  
ANNO

L'EFFETTO COMPLESSIVO SULLA  
MITIGAZIONE È POTENZIATO DAL  
SEQUESTRO DEL CARBONIO

IL BIOCHAR PU  
ESSERE EFFICAC  
NEL MITIGAR  
L'EMISSIONE DI N<sub>2</sub>O  
CON UNA RIDUZIONE  
MEDI  
DELL'EMISSIONE DE  
20-30% IN FUNZION  
NO D  
CONSERVAZIONI

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**GRAZIE PER  
L'ATTENZIONE!**

INFOCHAR - Milano 19/05/2019



# International agreements

Main source:

<https://www.un.org/en/sections/issues-depth/climate-change/index.html>

## International Panel on Climate Change (IPCC) >>> 1988

The IPCC was set up by the World Meteorological Organization (WMO) and United Nations Environment to provide an objective assessment of scientific information.

## United Nations Framework Convention on Climate Change (UNFCCC) >>>

In 1992, its “Earth Summit” produced the United Nations Framework Convention on Climate Change (UNFCCC) as a first step in addressing the climate change problem. Today, it has near-universal membership. The 197 countries that have ratified the Convention are Parties to the Convention. The ultimate aim of the Convention is to prevent “dangerous” human interference with the climate system.

## Kyoto Protocol >>> 1997

The Kyoto Protocol legally binds developed country Parties to emission reduction targets. The Protocol’s first commitment period started in 2008 and ended in 2012. The second commitment period began on 1 January 2013 and will end in 2020. Unfortunately, only 111 countries have ratified the protocol, Canada, Russia and New Zealand do not participate to the second commitment period. This largely means that the protocol is currently applied to approximately 14% of global emissions.

## Paris Agreement >>> 2016

The Paris Agreement’s central aim is to strengthen the global response to the threat of climate change by keeping the global average temperature rise this century well below 2° C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 ° C. On Earth Day, 22 April 2016, 175 world leaders signed the Paris Agreement at United Nations Headquarters in New York. This was by far the largest number of countries ever to sign an international agreement on a single day.